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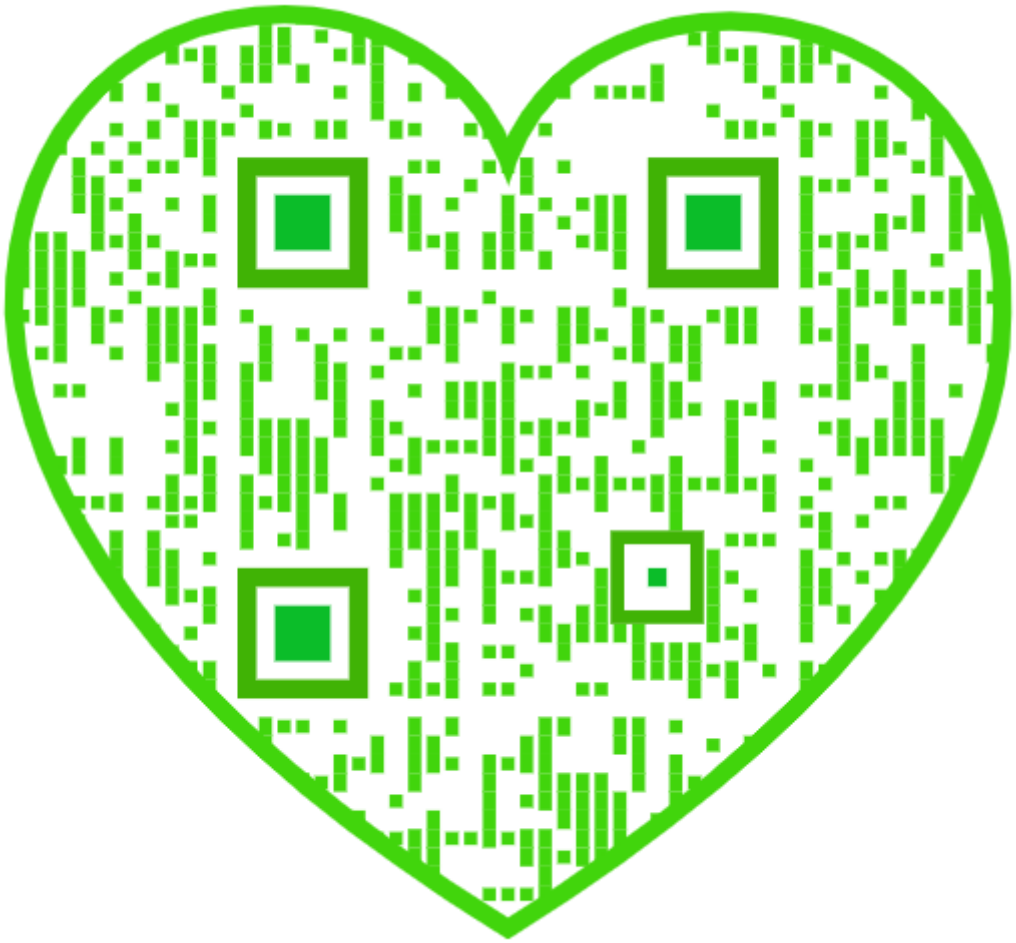

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Trees of the United States Important in Forestry.

BY

GEORGE B. SUDWORTH,

Dendrologist of the Division of Forestry.

Reprint from Yearbook of Department of Agriculture for 1897.

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TREES OF THE UNITED STATES IMPORTANT IN FORESTRY.

By Geo. B. Sudworth, Dendrologist of the Division of Forestry.

The following list of 100 species of trees native to the United States has been selected from the 450 indigenous species as of special value in forestry. It is a revision and enlargement of a similar list published in the Report of the Chief of the Division of Forestry for 1886, and is intended to acquaint the would-be planter or forest manager briefly with the character and distribution of those species which with our present knowledge may be considered as of highest forestal value, and may aid him in forming an estimate of their comparative value for his purposes. This does not exclude the possibility of extending the list as investigation proceeds.

In using this table as a help to the selection of species for planting in any locality, the reader should be guided by his knowledge of the native trees of the region. Many of the trees in the list are of very wide natural distribution, but even those of limited range, such as the Catalpa, the Black Walnut, the Pecan, and Black Cherry have been found to succeed under cultivation over more extended areas.

Generally speaking, northern forms suffer when taken far south, probably owing to the prolonged and excessive heat, while southern forms are unable to endure northern winters. This is true even within the limits of the species for northern and southern forms. Thus Black Walnut from southern seed is not hardy at the northern limit of distribution of this tree. It becomes, therefore, necessary in selecting plant material to make sure that the seed comes from a locality which is climatically not less rigorous than the one in which the plants are to be used.

In the same way many species that are native of the Eastern forests do not succeed in the dry plains of the West, nor are the trees of the northern Pacific Slope hardy in the Mississippi Valley. The influence of moisture of air and soil must therefore be considered, as well as the influence of temperature.

The exact limits within which any species may be successfully cultivated can only be determined by experimental planting. Until this is accomplished a safe rule is to make selections for any locality from the native forms of the immediate region, or of similar conditions of soil and climate.

The notes on the character and uses of wood will be found helpful, not only in selecting trees for planting, but equally in determining what species to favor in the treatment of wood lots and in forest operations generally.

The relative value of the different species here enumerated is indicated in three classes by difference in type, as follows: First grade, **WHITE PINE**; second grade, JEFFREY PINE; third grade, PITCH PINE.

The size stated refers to averages of mature trees; the + sign denoting that larger dimensions are not uncommon.

A. CONIFERS.

(Evergreens and needle-leafed trees, with a few exceptions.)

The most valuable forest trees, as well on account of their usefulness as for their effects in forestry, due to the evergreen foliage of most of them persistent through several years; most capable of covering extensive areas exclusively, and with deciduous trees most excellent aids in forestry on account of their habit of growth and their soil-improving qualities; practically not capable of reproduction by sprouting from the stocks or cuttings; mostly periodical seeders; persistent growers.

PINES.—The most useful conifers and most important forest trees, mostly of the plain; reaching desirable development in comparatively dry, even barren situations. Mostly needing light; tolerably rapid growers; best on light sandy soils with clay subsoil.

Characteristics.—Leaves arranged in twos, threes, or fives in one sheath; cones with thickened scales; seeds almond-shaped, nut-like, of mottled appearance, with their wings only lightly attached; maturing the second year, and preserving their germinating power well. Sixty to seventy species, of which thirty-five are indigenous to the United States.

Wood.—Very variable, very light and soft in "soft" pine, such as white pine; of medium weight to heavy and quite hard in "hard" pine, of which Longleaf or Georgia pine is the extreme form. Usually it is stiff, quite strong, of even texture, and more or less resinous. The sapwood is yellowish-white; the heartwood, orange-brown. Pine shrinks moderately, seasons rapidly and without much injury; it works easily; is never too hard to nail (unlike oak or hickory); it is mostly quite durable, and if well seasoned is not subject to the attacks of boring insects. The heavier the wood, the darker, stronger, and harder it is, and the more it shrinks and checks. Pine is used more extensively than any other kind of wood. It is the principal wood in common carpentry, as well as in all heavy construction, bridges, trestles, etc. It is also used in almost every other wood industry, for spars, masts, planks, and timbers in shipbuilding, in car and wagon construction, in cooperage, for crates and boxes, in furniture work, for toys and patterns, railway ties, water pipes, excelsior, etc. Pines are usually large trees with few branches, the straight, cylindrical, useful stem forming by far the greatest part of the tree; they occur in vast forests, a fact which greatly facilitates their utilization.

List of one hundred species of trees of the United States most valuable for timber, with notes on their range of distribution, cultural requirements, and the character and uses of their wood.

Name of species and limit of size.	Regions of abundant growth.	Characteristics and uses of wood.	Soil and climate, and characteristics of growth.
1. **WHITE PINE**.....	Northern; wide range, forming forests to Southern mountains.	Light, soft, not strong, heartwood durable in contact with the soil: *free from resin and easily worked.*	Best on light, sandy, fresh, deep soils, but successful on a large range of soils from dry to moist. Rapid grower; endures some shade; hardy, but little tolerant of drought.
(*Pinus strobus* Linn.) Height, 120 feet +; diameter, 3 feet +.	Best development in region of the Great Lakes.	Immense quantities used for *lumber* of different kinds, cabinet work, timber, shingles, laths, and inferior fuel.	The *most important* conifer of the United States; good quality, however, only in centenarians. Is best mixed with deciduous trees; of rather slow, but high percentage of germination; plant one or two-year-old transplanted seedlings, or sow.
2. **RED PINE**..... (NORWAY PINE.)	Northern; associated mostly with White Pine.	Light, harder and stronger than that of White Pine; elastic, very resinous; wide sapwood; hence young timbers, piles, etc.; not durable.	Soils like those of White Pine; adapted to many soils, but best quality of timber produced in well-drained sands. Extremely hardy; *vigorous* and *rapid* grower.
(*Pinus resinosa* Ait.) Height, 100 feet +; diameter, 2½ feet +.	Greatest development from Michigan to Minnesota.	Used chiefly for *lumber*, timber, and piles; in the trade, handled together with White Pine.	Should be favored in northern and northeastern planting with White Pine and deciduous trees. So far, seed very expensive and difficult to obtain.

List of one hundred species of trees of the United States most valuable for timber, etc.—Continued.

Name of species and limit of size.	Regions of abundant growth.	Characteristics and uses of wood.	Soil and climate, and characteristics of growth.
3. *PITCH PINE* (*Pinus rigida* Miller.) Height, 50 feet +; diameter, 1½ feet +.	Northeastern and Middle Atlantic States.	Light, brittle, harder, and stronger than that of White Pine. Employed chiefly for fuel and charcoal, but occasionally for inferior lumber and mine props.	Best on fresh to moist sand, but will succeed on dry, barren, sandy, or rocky soils, and even on wet, cold, swampy ground, or seacoasts liable to floods. A rapid grower, and when young hardy and indifferent to drought; light-needing; an early seeder; sprouts from the stump; not easily transplanted; best and *easily* propagated from *seed*; mainly for *seacoast* planting.
4. *JACK PINE* (SCRUB PINE. PRINCE'S PINE.) (*Pinus divaricata* (Ait.) Gord.) Height, 60 feet +; diameter, 1 foot +.	Northern (in United States), forming forests far north. Greatest development north of Lake Superior.	Among the lighter "hard pines" Employed chiefly for fuel and ties.	Common on sandy, barren soil. Valuable only as first cover for northern pine-barrens. Rapid grower in its youth and easily handled; very hardy, enduring heat and cold well; successful on the plains.
5. *SCRUB PINE* (*Pinus virginiana* Mill.) Height, 80 feet +; diameter, 2 feet +.	Middle Atlantic region	Extensively used for fuel; pump logs, water pipes, occasionally for piles and coarse lumber.	Common on poor, dry, sandy, gravelly, and clayey soils; less frequent in rich soils. Moderately rapid grower, quickly taking possession of old, worn-out fields and washed lands.
6. **LONGLEAF PINE** (SOUTHERN PINE. YELLOW PINE. GEORGIA PINE. HARD PINE.) (*Pinus palustris* Miller.) Height, 100 feet +; diameter, 2½ feet +.	South Atlantic and Gulf States.	Heavy, hard, tough, and very strong; *very durable, very resinous.* Chiefly for *lumber;* shipbuilding, fencing, ties; good fuel. The *turpentine*, tar, pitch, and spirits of turpentine of United States market derived almost entirely from this tree.	Well-drained, loose, deep sandy loam or gravel. The slow growth of first five years (quasi-endogenous) makes its forestry problematic; development dependent on atmospheric moisture; least shade-enduring of pines. Rare but plentiful seeder; germinates freely; can therefore be propagated by sowing seed in permanent place. Most valuable pine of the South, but for best quality requires long period of growth (two hundred years?).

7. **SHORTLEAF PINE** (Bull Pine. Yellow Pine. Spruce Pine.) (*Pinus echinata* Miller.) Height, 90 feet +; diameter, 2 feet +.	Middle Atlantic and Southern States; associated mostly with hardwood trees. Best development in western Louisiana, southern Arkansas, and eastern Texas.	Medium "hard pine" Used chiefly for furniture *lumber*. Very much like that of Longleaf Pine, but somewhat inferior; in some localities bled for turpentine.	More common on light sandy soil than on low borders of swamps. A rather slow grower; will succeed on the poorest soil. Easily reproduced; good seeder; light-needing.
8. **CUBAN PINE** (Slash Pine. Swamp Pine. Bastard Pine.) (*Pinus heterophylla* (Ell.) Sudw.) Height, 90 feet +; diameter, 2 feet +.	Southern and southeastern coast; local in swamps and near water courses. Best development in eastern Florida.	Heaviest and strongest of our hard pines; not distinguished in the market from Longleaf Pine. Employed for construction, timber, and lumber; yields resinous matter; equal to Longleaf Pine.	Light sandy soil; somewhat indifferent to drainage. *Rapid grower; easily reproduced;* matures seed yearly; competing with the Longleaf Pine on wet sags; light-needing.
9. **LOBLOLLY PINE** (Old-field Pine.) (*Pinus tæda* Linn.) Height, 100 feet +; diameter, 2½ feet +.	Southeastern Greatest development in Virginia and North Carolina.	Wood typical "hard pine;" mostly coarse-grained; wide sap; very variable in quality. Used principally for lumber of an inferior quality and for fuel; yields very little *resin*.	Low, moist, or dry sandy soils and abandoned fields. Adapted to a wide range of sites. Rapid grower; *light-needing;* seeds persistently and plentifully. A useful concomitant of Southern forestry.
10. *SPRUCE PINE* (Old-field Pine of Florida. Cedar Pine. White Pine.) (*Pinus glabra* Walter.) Height, 80 feet +; diameter, 2 feet +.	Southeastern States Best development in Alabama and Mississippi.	Light, *soft, easily worked*, brittle, not strong nor durable; resembles that of *Pinus tæda;* not resinous, coarse-grained, wide sap. Rarely cut: for inside work; not distinguished in the market from Loblolly and Shortleaf Pine lumber.	Grows on better and moister soils than *Pinus tæda*, Loblolly Pine hummocks and rich bottom lands; rare; usually isolated or in groups. A rapid grower; shade-enduring.
11. **BULL PINE** (Yellow Pine. Heavy-wooded Pine.) (*Pinus ponderosa* Douglas.) Height, 200 feet +; diameter, 12 feet +.	Rocky Mountains to the Pacific, up to high elevations; forming forests. Best developed on western slope of Sierras of northern and central California.	Very variable in quality, brittle, strong; not durable. Employed largely for lumber, mining timber, ties, and fuel.	Dry, rocky ridges and prairies, sometimes in swamps; but best in deep loamy sand. Vigorous, rapid grower; very hardy, except when quite young. Well adapted to dry, windy, exposed places; succeeds on Western prairies. The pine for reforesting southern exposures of the Western mountain regions.

List of one hundred species of trees of the United States most valuable for timber, etc.—Continued.

Name of species and limit of size.	Regions of abundant growth.	Characteristics and uses of wood.	Soil and climate, and characteristics of growth.
12. JEFFREY PINE (BULL PINE.) (*Pinus jeffreyi* Murray.) Height, 100 feet +; diameter, 4 feet +.	California and Oregon; western slopes of Sierra Nevada above 6,000 feet.	Quality and uses like Bull Pine	Replacing Bull Pine; rare.
13. *BRISTLE-CONE PINE* (*Pinus aristata* Engelm.). Height, 100 feet; diameter, 4 feet.	Local—Rocky Mountains and southeastern California; above 7,500 feet.	Light, soft, not strong In Nevada employed for mining-timber.	Dry, gravelly ridges. The White Pine for cover of high elevations in southern Rocky Mountains.
14. **SUGAR PINE** (*Pinus lambertiana* Dougl.) Height, 150 feet +; diameter, 4 feet +.	Western Pacific slope Best development in Sierras of central and northern California above 4,000 feet; lower in Oregon.	Typical "soft pine," like the White Pine of eastern United States, and used similarly. Seeds large and edible.	Very rapid grower. Quite hardy in the East. Best Pine for reforestation in its native habitat.
15. *MONTEREY PINE* (*Pinus radiata* Don.) Height, 80 feet +; diameter, 2 feet +.	Local—California coast, south of San Francisco.	Light, soft, brittle, not strong; according to some authorities, tough and of good repute.	Light, well-drained soils, and on drifting sands. Easily propagated; seed of very high percentage of germination; very rapid grower. Useful for reforesting Western barrens.

II. SPRUCES.—Next in importance to the pines, though the wood is less resinous, weaker, and not so durable. Of northern or mountain habitat, in cool situations and moist soils; endures shade and grows mostly with rapidity and persistency. The Norway Spruce of Europe appears, so far, superior for forestry to the native species.

Characteristics.—Leaves single, rigid, sharp-pointed, four-cornered, bristling mostly all around the twigs; cones oblong, hanging, with thin, persistent scales; seeds resembling those of the pines, but usually smaller, more uniform in color, and angular; mature the first year, and preserve power of germination well; mostly periodical, but seeds abundantly; crown pyramidal; about twelve species, of which five are indigenous. Spruce wood resembles soft pine, is light, soft, stiff, moderately strong, less resinous than pine; has no distinct heartwood, and is of whitish color; used like soft pine, but also employed as resonance wood, and preferred for paper pulp. Spruces, like pines, form extensive forests. They are more frugal, thrive on thinner soils, and bear more shade, but usually require a more humid climate. "Black" and "white" spruce, as applied by lumbermen, usually refer to narrow and wide ringed forms of the Black Spruce (*Picea mariana*).

List of one hundred species of trees of the United States most valuable for timber, etc.—Continued.

Name of species and limit of size.	Regions of abundant growth.	Characteristics and uses of wood.	Soil and climate, and characteristics of growth.
16. BLACK SPRUCE	Mainly northeastern;* forming forests.	Light, soft, strong	Light, dry, stony soils; much smaller in cold, wet swamps.
(*Picea mariana* (Mill.) B. S. P.)	Best development north of latitude 50°.	Used most largely for pulp, also for lumber, shipbuilding, posts, piles, poles, ties; *tougher*, *stronger*, and more *elastic* than that of white pine; not good fuel.	Endures less shade than Norway Spruce; rapid grower.
Height, 80 feet; diameter, 1½ feet +.			
17. WHITE SPRUCE	Mainly northeastern and extending into Rocky Mountains: forming forests.	Like the Black Spruce, from which the timber is not distinguished in commerce, and used for the same purposes.	Like Black Spruce, but probably better adapted to western planting, being hardier.
(*Picea canadensis* (Mill.) B.S.P.			
Height, 100 feet; diameter, 1½ feet +.			
18. ENGELMANN SPRUCE	Western mountain regions and northward; high elevation.	Very light, soft, not strong	Dry, gravelly slopes, 5,000 to 11,500 feet.
(WHITE SPRUCE.)		Resembles the wood of eastern spruces in quality and uses.	A tree for reforestation of mountain slopes along wafer courses.
(*Picea engelmanni* Engelm.)	Best development in central Rocky Mountain region, between 9,000 and 10,000 feet.	Used chiefly for lumber; bark used in tanning. (?)	
Height, 100 feet +; diameter, 3 feet +.			
19. SITKA SPRUCE	Alaska and Northwestern coast; low elevations.	Light, soft, not strong (according to others strong); superior to that of other native species, but almost always coarse-grained.	Moist soil and climate, at least a moist subsoil, shady situations. *Rapid grower.*
(TIDE-LAND SPRUCE.)			Probably hardy in Northeastern and Middle States, in shaded positions.
(*Picea sitchensis* Carrière.)		Used chiefly as lumber for construction, interior finish, fencing, boat-building; cooperage, woodenware, boxes.	
Height, 150 feet +; diameter, 6 feet +.			

*Includes also the Red Spruce (*Picea rubra*), this being the principal timber spruce of the region.

III. FIRS.—Important to forestry mainly on account of their great endurance of shade. Of northern and mountain distribution; still more dependent on moisture of climate and cool or at least evenly tempered situations than the spruces, and in their youth mostly less hardy; usually grow slowly, but persistently. Some exotics seem to be of more value than the native species (*Abies nordmanniana*).

Characteristics.—Leaves single, flat, rather blunt, arranged somewhat comb-like on the twigs. Cones cylindrical, standing erect on the branches: scales thin, and falling away when mature; seeds triangular, partly inclosed by a more or less persistent wing; mature first year, but do not preserve their power of germination well. Frequent and abundant seeders. Crown conical. About eighteen species, of which eight are indigenous.

The name is frequently applied to wood and to trees which are not fir; most commonly to spruce, but also, especially in English markets, to pine. The wood resembles spruce in color, quality, and uses, but is easily distinguished from it, as well as from pine and larch, by the absence of resin ducts.

List of one hundred species of trees of the United States most valuable for timber, etc.—Continued.

Name of species and limit of size.	Regions of abundant growth.	Characteristics and uses of wood.	Soil and climate, and characteristics of growth.
20. WHITE FIR (BALSAM FIR. BLACK BALSAM.) (*Abies concolor* (Gord.) Parry.) Height, 100 feet +; diameter, 4 feet +.	Southwestern mountains and Pacific slope; high elevations. Best development in Sierras of California.	Very light, soft, not strong Occasionally manufactured into lumber, butter tubs, and used for other domestic purposes.	Moist slopes and canyons, between 3,000 and 9,000 feet; cool and shady situations.
21. *BALSAM FIR* (BALM OF GILEAD FIR.) (*Abies balsamea* Miller.) Height, 70 feet +; diameter, 1½ feet +.	Northeastern States and northward.	Very light, soft; not strong nor durable in contact with the soil. Used for common lumber (box-boards) and pulp wood.	Cold, damp woods and swamps. Rapid grower. Valuable only as undergrowth, or as nurse, and in imperfectly drained situations.
22. GREAT SILVER FIR (WHITE FIR.) (*Abies grandis* Lindl.) Height, 200 feet; diameter, 5 feet +.	Northwestern coast Best development in western Washington and Oregon, along river bottoms.	Light, soft, not strong For lumber, cooperage, etc	Bottom lands; rich moist soil. Very hardy and rapid grower; affected less by late frosts and occasional droughts than most firs.

23. NOBLE FIR..... (*Abies nobilis* Lindl.) Height, 200 feet +; diameter, 5 feet +.	Northwestern coast; wide range; always near mountain tops and high elevations; found often in groves dispersed through extensive forests.	Light, hard, elastic, and tolerably strong.	Probably hardy east of the Rocky Mountains, with proper protection.
	Best development in Sierra Nevada, from Columbia River to northern California.	Excellent lumber for interior finish. Sold in market as "larch."	Requiring moist atmosphere for best development.
24. AMABILIS FIR..... (*Abies amabilis* (Loud.) Forbes.) Height, 100 feet +; diameter, 4 feet +. According to others, 250 feet high and 5 feet in diameter.	Northwestern coast, mostly associated with the preceding species.	.....	Gravelly soils. Will probably prove hardy in Eastern States.
	Best development on mountains south of Columbia River; 3,000 to 4,000 feet.	Like Noble Fir, with which it is cut and marketed.	

IV. BASTARD SPRUCES.—Under this name may be grouped the Hemlocks and Douglas Spruce, formerly classed with the spruces and firs proper. Mostly of northern distribution, and therefore best adapted to cool, moist situations; enduring considerable shade. Some of the species grow very rapidly.

Characteristics.—Leaves single flat, linear, with distinct stalks (petioles) somewhat comb-like in their arrangement on the twigs. Cones usually small, with thin scales, hanging from the ends of the branches. Seeds, partly inclosed in a persistent wing; resemble those of the firs, but of smaller size; mature the first year, do not keep well; low percentage of germination. Branches pendant; crown spindle-like in form. Two genera, comprising seven species, five of which are indigenous.

The wood of the Douglas Spruce resembles the common "hard pine" (Red, Loblolly, etc.) in texture and grain, resembles the larch in color, and is used for all purposes for which pine is employed, the excellent dimensions naturally leading to its preference for many purposes.

The wood of the Eastern Hemlock is used chiefly for dimension stuff, also for boards, and recently for pulp; but it has been well demonstrated that the wood is well suited even for finishing lumber, and that the prevailing prejudice against it is as unwarranted in the case of the Eastern as in that of the Western Hemlock. The appearance of the wood in oil finish is very satisfactory.

List of one hundred species of trees of the United States most valuable for timber, etc.—Continued.

Name of species and limit of size.	Regions of abundant growth.	Characteristics and uses of wood.	Soil and climate, and characteristics of growth.
25. **DOUGLAS SPRUCE** (Red Fir. Yellow Fir. Oregon Pine.) (*Pseudotsuga taxifolia* (Poir.) Britt.) Height, 300 feet +; diameter, 10 feet +.	Rocky Mountain region to Pacific; wide range; forming forests. Best development in western Oregon and Washington.	Rather heavy, hard, strong, durable. Used chiefly for *lumber* and in construction, for ties, piles, and fuel; bark employed in tanning.	Accommodates itself to many soils, but prefers a deep and moist cool and well-drained one; succeeds well on a dry slaty soil, and on sand dunes and exposed situations. Surpasses almost all of the conifers in the *rapidity* of its growth, and endures *drought* better than most of them; *shade-enduring.* One of the largest and most important forest trees of the West. For Eastern planting seed should be procured from Colorado or Montana. Repairs damage very readily.
26. HEMLOCK (*Tsuga canadensis* (Linn.) Carr.) Height, 80 feet +; diameter, 3 feet +.	Northern and Eastern States, forming forests. Best development probably in Canada.	Light, soft, rather strong, not durable; mostly fine-grained, and peculiar for holding nails well. Usually manufactured into coarse lumber; used also for ties, construction, etc. The *tan-bark* of this species is the principal one used in Northern States.	Light, alluvial loam, well-drained, but cool and moist situations. Grows slowly when young, but tolerably rapidly after four or five years; endures shade. Excellent nurse tree for white pine, with which it is usually associated.
27. WESTERN HEMLOCK (*Tsuga mertensiana* (Bong.) Carr.) Height, 180 feet +; diameter, 6 feet +.	Northwestern States, between 1,000 and 4,000 feet. Best development in western Oregon and Washington.	Rather heavy, hard, strong. Employed somewhat for coarse lumber; would make good finishing material. The bark contains tannin, but is too thin for economic use.	A substitute for the above species on the Pacific Coast. An exceedingly rapid grower, even on poor soils. Very shade enduring, forming large part of the undergrowth in its habitat.

V. Deciduous Conifers.—Though botanically not classed together, yet in forestry they may be considered allied, as the yearly fall of leaves improves the soil, while the absence of foliage during the winter and early spring distinguishes them from the evergreens, and their extreme need of light requires similar forest management. The Larches are of Northern or mountain habitat and the Bald Cypress of local southern distribution, but all are adapted to various situations. The European Larch probably surpasses the Northeastern Tamarack in every respect.

Characteristics.—Larches: Leaves in clusters, slender and soft. Cones small, egg-shaped, or elongated, with thin scales. Seeds small, triangular, nut-like in shape; mature the first year. Produces seed frequently and abundantly. Seeds keep well, but are of low percentage of germination.

Bald Cypress: Leaves single, sharp-pointed, very small and scanty, comb-like in the arrangement on the young twigs. Cones ball-like, with thick, woody scales, falling apart when mature. Seeds irregularly triangular-shaped, with hard, thick, wood-like shell; mature yearly abundantly, and keep well.

List of one hundred species of trees of the United States most valuable for timber—Continued.

Name of species and limit of size.	Regions of abundant growth.	Characteristics and uses of wood.	Soil and climate, and characteristics of growth.
28. **BALD CYPRESS** (*Taxodium distichum* Rich.) Height, 150 feet; diameter, 8 feet.	South Atlantic and Gulf States, forming forests in swamps and pine-barren ponds.	Moderately light, soft, and stiff; *very durable* in contact with the soil. Used largely in manufacture of *lumber* for construction and interior finish, *shingles*, for ties, posts, cooperage.	Indifferent to imperfect drainage and flooding, but capable of rapid growth on well-drained, moist, sandy soils, and hardy as far north as latitude 39° and 40°, and even on Western prairies. Positively light-needing. To be recommended for extensive planting in favorable situations, where even, superior lumber may be expected.
29. *TAMARACK* (BLACK LARCH. HACKMATACK.) (*Larix laricina* (Lu Roi) Koch.) Height, 80 feet; diameter, 1 foot +.	Northeastern (in United States) Best development probably north of the United States boundary.	Heavy, hard, very *strong; moderately durable* in contact with the soil. Employed largely for upper knees of vessels, *ship timbers*, posts, *ties*, *telegraph poles*, and occasionally for lumber.	North of United States boundary, found on moist uplands; south in United States, in cold, wet swamps; but probably of more value when grown on deep, moist, well-drained soils, in cool situations. Rapid and persistent grower; light-needing. Deserves attention in Northern forestry, but only in mixed growths.
30. **WESTERN LARCH** (TAMARACK.) (*Larix occidentalis* Nutt.) Height, 100 feet +; diameter, 4 feet +.	Northwestern; elevations between 2,500 and 5,000 feet. Best development in valley of Flathead River, Montana.	Heavy, very hard, strong; durable in contact with the soil. Chiefly for posts, ties, fuel, and occasionally for lumber.	An important tree as a Western representative of the foregoing species, occupying dry slopes in dry climate.

VI. CYPRESS FAMILY.—Under this head may well be grouped the junipers and so-called cedars, to which can be added the California redwoods. Characterized mostly by the shingle-like arrangement of their small, scaly leaves, the small, roundish fruit (a cone, or *berry-like ?*), and by the usually upright habit of the branches and scanty fall of leaves.

Their great endurance of shade makes them valuable adjuncts to forestry; otherwise of only secondary importance. Of the many species contained in seven genera, but fourteen are found in the United States.

Wood light, soft, stiff, not strong, of fine texture: sap and heartwood distinct, the former lighter, the latter a dull, grayish brown, or red. The wood seasons rapidly, shrinks and checks but little, and is very durable. Used like soft pine, but owing to its great durability preferred for shingles, etc. Small sizes used for posts, ties, etc. Cedars usually occur scattered, but they form in certain localities forests of considerable extent.

List of one hundred species of trees of the United States most valuable for timber—Continued.

Name of species and limit of size.	Regions of abundant growth.	Characteristics and uses of wood.	Soil and climate, and characteristics of growth.
31. **RED JUNIPER** (SAVIN.) (*Juniperus virginiana* Linn.) Height, 50 feet +; diameter, 1½ feet +.	Eastern United States Best development in valley of Red River, Texas.	*Light, soft*, brittle, fine-grained; very *durable* in contact with the soil. Fence posts, ties, telegraph and telephone poles, piles, cabinetwork, and almost alone for wood of lead *pencils*.	Prefers a mild climate; deep swamps, borders of streams, ridges, hills; will thrive on a rather dry, loose soil. Easily propagated from seed and cuttings. Perhaps the most important conifer for Southwestern prairie planting, enduring drought and partial shade. Tolerably rapid grower.
32. WHITE CEDAR. (*Chamæcyparis thyoides* (Linn.), B. S. P.) Height, 70 feet +; diameter, 1½ feet +.	Atlantic and Gulf States to central Mississippi. Most abundant and best developed in Virginia and North Carolina.	Light, soft, fine-grained; *very durable* in contact with the soil. Used principally for shingles, ties, posts, telephone and telegraph poles, piles, cooperage, boat building, wooden ware.	Always in low, marshy, or wet ground, where it thrives well and grows rapidly. Endures moist, upland soils, but with slow growth. Very shade-enduring; easy to propagate from seed or cuttings.
33. PORT ORFORD CEDAR. (*Chamæcyparis lawsoniana* (Murr.) Parl.) Height, 150 feet +; diameter, 8 feet +.	Small range: in Oregon along western coast from Coos Bay, Oregon, to Crescent City, Cal.	Light, hard, strong, close-grained; very durable lumber for interior finish, ties, posts, and for boat and ship building.	Commonly in low, moist, rich soil. Apparently hardy in the Northeastern States and succeeds on deep, rich, upland soils and maintains itself in clay loam.
34. **YELLOW CEDAR** (*Chamæcyparis nootkatensis* (Lamb.) Spach.) Height, 150 feet +; diameter, 5 feet +.	Northwest coast region, from Mt. Jefferson northward. Most common on the seacoast north of United States boundary.	Light, hard, brittle, very fine-grained, and durable. Cut without distinction together with Pacific arbor vitæ; largely used for doors, blinds, interior finish, cabinetwork.	Like Arbor Vitæ.
35. *ARBOR VITÆ* (WHITE CEDAR.) (*Thuja occidentalis* Linn.) Height, 50 feet +; diameter, 1½ feet.	Northeastern States and northward.	Light, soft; not strong; *very durable* in contact with the soil. Used chiefly and largely for posts, ties, telephone and telegraph poles, and shingles.	Will grow well in any soil not too stiff; often forming dense, pure growths in wet, boggy swamps. Rapid grower; easily propagated; desirable for undergrowth and to fill out places where other trees fail to come.

36. GIANT ARBOR VITÆ ..... (RED CEDAR. YELLOW CEDAR.) (*Thuja plicata* Don.) Height, 150 feet +; diameter, 9 feet +.	Northwestern coast and from Humboldt, Cal., to British Columbia. Best development north of Seattle.	Light, soft, brittle; not strong; very durable in contact with the soil. Used principally for interior finish, cabinetmaking, shingles, cooperage, fencing. Indians of Northwest employ it exclusively for making canoes.	Like the above species, on Pacific Coast.
37. INCENSE CEDAR ..... (BASTARD CEDAR. POST CEDAR. INCENSE CEDAR.) (*Libocedrus decurrens* Torr.) Height, 100 feet +; diameter, 6 feet +.	In interior valley between Coast range and Sierra from middle Oregon to California; (between 3,000 and 8,500 feet.)	Light, soft, brittle, not strong; very durable in contact with the soil; but according to others not at all so. Used for fencing, posts, water-flumes, and other home consumption; often "pecky."	Slopes and valleys, in well-drained and dry soils. Rapid grower; of excellent appearance. In the East probably adapted only to Southern States; succeeds excellently at Washington, D. C.
38. **REDWOOD** ..... (*Sequoia sempervirens* Endl.) Height, 300 feet +; diameter, 20 feet +.	California coast from Oregon southward; forest-forming.	Light, soft, brittle, not strong; very durable in contact with the soil. The chief and most valuable building timber of the Pacific Coast. In California used almost entirely for shingles, posts, ties, poles, telegraph poles, water tanks, tubs, etc.	Low, moist, well-drained situations and damp climate; not on dry hillsides. Vigorous and persistent grower; shade-enduring; sprouts from the stump. Highly important for California forestry; perhaps also for that of Southern States.
39. *BIG-TREE* ..... (*Sequoia washingtoniana* (Winsl.) Sudw.) Height, 350 feet +; diameter, 35 feet +.	California; very local and isolated.	Light, soft, brittle, weak; exceedingly durable in contact with the soil. Once locally used for lumber, fencing, shingles, construction, etc.	Moist situations, between 4,000 and 6,000 feet. Probably only of historical interest.

B. BROAD-LEAFED TREES.

(With few exceptions these trees are deciduous.) Neither a strictly botanical nor a strictly practical classification in large groups has been attempted, but a sequence within botanical relations, and an arrangement according to the nature of the seed has been more or less observed, placing first the acorn and nut-bearing trees, next those with hard, wingless seeds, and lastly, those with soft and winged seeds.

THE OAKS.—Wood very variable, usually very heavy and hard, very strong and tough, porous, and of coarse texture; the sapwood whitish, the heart "oak" brown to reddish brown. It shrinks and checks badly, giving trouble in seasoning, but stands well, is durable, and little subject to attacks of insects. Oak is used for many purposes: in shipbuilding, for heavy construction, in common carpentry, in furniture, car, and wagon work, cooperage, turnery, and even in wood carving; also in the manufacture of all kinds of farm implements, wooden mill machinery, for piles and wharves, railway ties, etc. The oaks are medium to large sized trees, forming the predominant

part of a large portion of our broad-leafed forests, so that these are generally "oak forests," though they always contain a considerable proportion of other kinds of trees. Three well-marked kinds—white, red, and live oak—are distinguished and kept separate in the market. Of the two principal kinds white oak is the stronger, tougher, less porous, and more durable. Red oak is usually of coarser texture, more porous, often brittle, less durable, and even more troublesome in seasoning than white oak. In carpentry and furniture work, red oak brings about the same price at present as white oak. The red oaks everywhere accompany the white oaks, and, like the latter, are usually represented by several species in any given locality. Live oak, once largely employed in shipbuilding, possesses all the good qualities (except that of size) of white oak, even to a greater degree. It is one of the heaviest, hardest, and most durable building timbers of this country; in structure it resembles the red oaks, but is much less porous.

List of one hundred species of trees of the United States most valuable for timber—Continued.

Name of species and limit of size.	Regions of abundant growth.	Characteristics and uses of wood.	Soil and climate, and characteristics of growth.
40. **WHITE OAK**	North Central, Central, and Eastern States.	Heavy, hard, strong, tough, durable in contact with the soil.	Grows well on a great variety of soils, but best on deep, moderately moist, well-drained loamy sand, and in warm situations. Slow but persistent grower; light-needing; capable of enduring shade, but not with advantage. Most valuable of the American oaks.
(*Quercus alba* Linn.)	Best development on western slopes of Alleghany Mountains and valley of Ohio River.	Chiefly for shipbuilding, construction of all kinds, *cooperage*, carriage and wagon stock, *agricultural implements*, fencing, posts, ties, *piles*, cabinetmaking, interior finish, coarse lumber, and fuel.	
Height, 100 feet +; diameter, 3 feet +.			
41. **COW OAK**	Southeastern	Equal to the White Oak	Moist, rich soil; will endure flooding.
(SWAMP CHESTNUT OAK, BASKET OAK.)	Best development on the rich bottom lands of southeastern Arkansas and Louisiana.	Largely employed in the manufacture of agricultural implements, wheel stocks, cooperage, baskets, fencing and fuel.	The most valuable of the White Oaks for the Gulf States.
(*Quercus michauxii* Nutt.)			
Height, 100 feet +; diameter, 3 feet +.			
42. **CHINQUAPIN OAK**	Central and Middle Atlantic region.	Very much like White Oak	Best in deep, rich, moist, well-drained bottom lands, but grows well and is not uncommon on dry, fertile, limestone soils; it also succeeds on clayey and sandy soils of uplands.
(*Quercus acuminata* (Michx.) Houba.)	Largest growth in lower Ohio Valley.	Employed largely in cooperage, wagon-making, for ties, posts, and coarse lumber.	
Height, 80 feet +; diameter, 3 feet +.			
43. LIVE OAK	Southern States	Very heavy, hard, *strong*, tough, and durable.	Warm, loamy soil, retentive of moisture, and free from overflow.
(*Quercus virginiana* Miller.)	Greatest development in Southern Atlantic States.	Once largely employed in shipbuilding, but now only occasionally; somewhat for tool stock.	One of the most *rapid* growers *of all the oaks; most shade-enduring;* evergreen foliage. Especially desirable for Southern forestry.
Height, 80 feet +; diameter, 3 feet +.			

44. *CAÑON LIVE OAK* (MAUL OAK. VALPARAISO OAK.) (*Quercus chrysolepis* Liebm.) Height, 80 feet +; diameter, 5 feet +.	Pacific States, 3,000 to 8,000 feet elevation.	Very heavy, hard, tough; very strong Employed considerably in the manufacture of agricultural implements, wagons, etc.	Warm, dry, sunny exposures. Most valuable of the Pacific oaks. Foliage evergreen.
45. TAN-BARK OAK (PEACH OAK.) (*Quercus densiflora* Hook. & Arnott.) Height, 60 feet +; diameter, 2 feet +.	Pacific coast Best development in redwood belt on California coast.	Heavy, hard, strong; inferior to other white oaks; valued chiefly for tan bark.	Well drained, rich soils. Shade-enduring. Foliage evergreen.
46. CHESTNUT OAK (ROCK CHESTNUT OAK.) (*Quercus prinus* Linn.) Height, 80 feet +; diameter, 3 feet +.	Northeastern Best development in southern Alleghany Mountains.	Somewhat less valuable than White Oak Less valuable than the foregoing species. Used chiefly for fencing, ties, and somewhat for coarse lumber. Valued principally for *tan bark*.	For planting on rocky banks and hillsides; never in any but well-drained situations.
47. **BUR OAK** (MOSSY-CUP OAK. OVERCUP OAK.) (*Quercus macrocarpa* Michx.) Height, 100 feet +; diameter, 3½ feet +.	Mainly Northeastern United States; extends farthest west and northwest of any of the Eastern oaks.	Heavy, hard, strong, tough; most *durable* in contact with the soil of any of American oaks. Employed for the same purposes as that of White Oak; more durable, but porous.	Requires better soil than White Oak—deep, rich loam; more shade-enduring. A Western substitute for White Oak, and especially recommended for prairie planting.
48. **POST OAK** (IRON OAK.) (*Quercus minor* (Marsh.) Sarg.) Height, 80 feet +; diameter, 2½ feet +.	East of the Rocky Mountains	Equal to White Oak Chiefly for fencing, ties, fuel, and occasionally for carriage stock, cooperage, and other construction; usually not distinguished from White Oak in the market.	Well-drained gravelly uplands, clay barrens, and poor sandy loams. Recommended for Western planting.

List of one hundred species of trees of the United States most valuable for timber—Continued.

Name of species and limit of size.	Regions of abundant growth.	Characteristics and uses of wood.	Soil and climate, and characteristics of growth.
49. OVERCUP OAK	Southeastern United States	Like White Oak and used for the same purposes.	Chiefly in wet or submerged swamps, but grows well in well-drained bottom lands and on rich, gravelly or sandy loam uplands.
(*Quercus lyrata* Walt.)	Best developed in Arkansas and adjacent Texas.		
Height, 80 feet +; diameter, 2 feet +.			
50. SWAMP WHITE OAK	Northeastern United States	Like the White Oak and used for the same purposes, but perhaps more durable in contact with the soil.	In deep moist or inundated swamps and low banks of water courses. Succeeds in all loose, rich, fairly moist upland soils.
(*Quercus platanoides* (Lam.) Sudw.)	Best development in region south of the Great Lakes.		
Height, 90 feet +; diameter, 2 feet +.			
51. **RED OAK**	East of Rocky Mountains	Heavy, hard, strong; inferior in quality to White Oaks.	Thrives in all soils, except an undrained one.
(*Quercus rubra* Linn.)	Most northerly of Atlantic oaks.	Largely employed for cooperage, manufacture of furniture, and for interior finish. Important for *tan-bark*.	The most *rapid* in growth of all the oaks. Sprouts vigorously from stump; of importance for tan-bark coppices.
Height, 100 feet +; diameter, 3½ feet +.	Best development in Massachusetts.		
52. **BLACK OAK**	East of longitude 96°, United States.	Heavy, hard, strong, not tough	Gravelly uplands; poorer soils than White Oak requires.
(YELLOW-BARK OAK. YELLOW OAK. QUERCITRON OAK.)	Best development in North Atlantic States.	Used for cooperage, agricultural implements, construction, and extensively for furniture and interior finish. Superior to White Oak for some purposes. Important for tan bark.	Next to the Red Oak in rapidity of growth.
(*Quercus velutina* Lam.)			
Height, 80 feet +; diameter, 3 feet +.			
53. SPANISH OAK	Central, Southeastern, and Southern States.	Heavy, very hard and strong; not durable.	Dry, barren soils; rapid grower.
(RED OAK.)	Best development in South Atlantic and Gulf States.	Used for cooperage, construction, and fuel. Important for tan bark.	
(*Quercus digitata* (Marsh.) Sudw.)			
Height, 80 feet +; diameter, 3 feet +.			

54. WATER OAK (DUCK OAK. POSSUM OAK. SPOTTED OAK.) (*Quercus nigra* Linn.) Height, 75 feet +; diameter, 3 feet +.	Central, Southern, and Southeastern States. Greatest development in eastern Gulf region.	Heavy, hard, strong Chiefly for fuel; also for cooperage and construction—hewn and sawn dimension timber sometimes passing for White Oak in inspection.	Heavy undrained soil; exceedingly rapid grower. A useful *concomitant* in Southern planting.
55. **BEECH** (*Fagus atropunicea* (Marsh.) Sudw.) Height, 100 feet +; diameter, 3 feet +.	East of Mississippi and Missouri rivers. Best development probably on "bluff" formations of Lower Mississippi basin.	Heavy, hard, stiff, strong, of rather coarse texture; white to light brown; not durable in the ground, and subject to the inroads of boring insects; shrinks and checks considerably in drying; works and stands well and takes a good polish. Used for furniture, in turnery, for handles, lasts, etc.	Fresh, rich, but not necessarily a deep soil; limestone soils. For rocky, exposed situations. Rapid grower and *enduring shade* exceedingly well, a fact which renders it one of the most valuable aids in forestry.
56. CHESTNUT (*Castanea dentata* (Marsh.) Borkh.) Height, 90 feet +; diameter, 14 feet +.	Northeastern and Middle Atlantic States. Best development on western slopes of Allegheny Mountains.	Light, moderately soft, stiff, not strong, of coarse texture. Shrinks and checks considerably in drying, works easily, stands well, and is very durable. Used in cabinetwork, cooperage, for railway ties, telegraph poles, and locally in heavy construction.	*Well drained* gravelly soils; succeeds on rocky hillsides with soil of sufficient looseness and depth; on northern and eastern exposures; will thrive on rather poor sand; slow and uncertain in stiff, clayey soil; on limestone only when well fissured. Exceedingly *rapid* grower; moderately shade-enduring; sprouts most vigorously and *persistently* from the stump; *large yield per acre.*
57. **BLACK WALNUT** (*Juglans nigra* Linn.) Height, 100 feet +; diameter, 4 feet +.	Northeastern, Central, and Southeastern States. Best development on southern slopes of Allegheny Mountains and in bottom lands of southwestern Arkansas and Indian Territory.	Wood heavy, hard, strong, of coarse texture. Shrinks moderately in drying; works and stands well; takes a good polish; for a long time the favorite cabinet wood in this country; the dark heart wood used largely as a veneer for inside finish and cabinetwork; also in turnery, for gunstocks, etc.	Deep, loose, fresh to moist, warm, and sandy loam; will grow in a dry and compact soil, but not in a wet one. Hardy and rapid grower, especially in height; only centenarians produce first-class quality of lumber, but useful timber may be produced in 40 to 60 years. Sprouts freely from the stump. Not recommended for arid or subarid regions nor for uplands.
58. *BUTTERNUT* (WHITE WALNUT.) (*Juglans cinerea* Linn.) Height, 80 feet +; diameter, 2 feet +.	Northeastern States Best development in basin of Ohio River.	Light, soft, durable, not strong Employed chiefly for cabinetwork and interior finish.	Prefers a deep, rich, *cool* loam: suited to cooler sites and colder climate than the foregoing species. Rapid grower when young.

THE HICKORIES, AND OTHER HARD-SEEDED VARIETIES.—*The Hickories.*—Wood very heavy, hard, and strong, tough, of rather coarse texture, smooth, and of straight grain. The broad sapwood white, the heart reddish nut brown. It dries slowly, shrinks and checks considerably; is not durable in the ground, or if exposed, and, especially the sapwood, is always subject to the inroads of boring insects.

Hickory excels as carriage and wagon stock, but is also extensively used in the manufacture of implements and machinery, for tool handles, timber pins, for harness work and cooperage. The hickories are tall trees with slender stems, never form forests, occasionally small groves, but usually occur scattered among other broad-leafed trees in suitable localities. The following species all contribute more or less to the hickory of the markets:

List of one hundred species of trees of the United States most valuable for timber—Continued.

Name of species and limit of size.	Regions of abundant growth.	Characteristics and uses of wood.	Soil and climate, and characteristics of growth.
59. **SHAGBARK HICKORY** (SHELLBARK HICKORY.) (*Hicoria ovata* (Mill.) Britt.) Height, 100 feet +; diameter, 2 feet +.	Eastern United States; wide range. Best development west of the Allegheny Mountains.	Very heavy, very hard, strong, *tough, elastic; not durable* in contact with the soil or exposed to the weather. Used chiefly for agricultural implements, *carriage stock*, ax and tool handles, baskets, etc.; best fuel.	Deep, fresh soil; a compact soil not objectionable; not on poor, dry, or wet soils. At first slow, but afterwards rapid grower; sprouts well from the stump. Moderately shade enduring. Somewhat liable to injury by frost.
60. BITTERNUT (PIGNUT. SWAMP HICKORY.) (*Hicoria minima* (Marsh.) Britt.) Height, 80 feet +; diameter, 2 feet +.	Eastern United States; wide range.	Heavy, rather hard, strong, tough; less valuable than that of Shagbark Hickory. Largely for ox yokes, hoop poles, and fuel.	To replace Shagbark Hickory on low, moist, or wet ground. Sprouts well from the stump. Less liable to frost than Shagbark Hickory, but more subject to the ravages of insects.
61. MOCKERNUT (BULLNUT. KINGNUT. BLACK HICKORY. BIGBUD HICKORY. WHITEHEART HICKORY.) (*Hicoria alba* (Linn.) Britt.) Height, 90 feet +; diameter, 3 feet +.	Eastern United States; wide range. Most abundant and generally distributed in the Southern States.	Very heavy, hard, tough, strong. Used for much the same purposes as that of Shagbark Hickory, very variable according to site; resembling Shagbark Hickory.	To replace Shagbark Hickory on poorer and drier soils; will succeed even on *barrens*. Sprouts well from the stump, but slow grower; liable to attacks of insects.
62. SHELLBARK HICKORY (BOTTOM SHELLBARK.) (*Hicoria laciniosa* (Michx. f.) Sarg.) Height, 70 feet +; diameter, 3 feet +.	Central United States; local.	Like Shagbark Hickory, and employed for much the same purposes.	Rich, deep soil; especially adapted to well-drained bottom lands, but succeeds with slower growth on drier uplands. Climatically confined.

63. **PECAN** (ILLINOIS NUT.) (*Hicoria pecan* (Marsh.) Britt.) Height, 75 feet +; diameter, 2 feet +.	Southwestern, but widely cultivated in Southern States. Best development in Arkansas and Indian Territory.	Like Shagbark Hickory Used chiefly for handle stocks, etc. Edible *nuts* an important article of commerce.	Deep, rich bottom land, but succeeds fairly on upland soils of moderate richness. Rapid grower; for Southwestern planting. More valuable perhaps for production of fruit than for timber purposes.
64. **BLACK CHERRY** (RUM CHERRY.) (*Prunus serotina* Ehrhart.) Height, 90 feet +; diameter, 2 feet +.	Eastern United States; wide range.	Rather heavy, hard, strong. Of light-red color. Chiefly for *cabinetwork* and *interior finish*.	Adapted to almost any soil and situation; best in deep, well-drained soil; will succeed also on dry soil. Very rapid grower, very soon reaching a useful size for cabinet wood. Endures considerable *shade* when young. The *wide range of sites* to which it is adapted, its rapid growth and endurance of shade place it among the most valuable forest trees of the United States, especially for Western planting. Not infected by caterpillars in forest plantations.
65. SWEET GUM (LIQUIDAMBER. RED GUM. STAR-LEAVED GUM. BILSTED.) (*Liquidambar styraciflua* Linn.) Height, 100 feet +; diameter, 3 feet +.	Southeastern States Greatest development in basin of Mississippi River.	Rather heavy and soft; strong, stiff, tough, not durable when exposed to the weather; shrinks and warps readily. Manufactured into lumber, clapboards, and coarse boards, mottled forms becoming popular for cabinetwork, veneering plates, hat blocks, baskets, etc.	Succeeds on a great variety of soils; a tree of the swamp as well as of dry soils; best on light, dry, sandy and soils retentive of moisture. Rapid grower. Insect proof and generally healthy.
66. LOCUST (LOCUST. YELLOW LOCUST.) (*Robinia pseudacacia* Linn.) Height, 80 feet +; diameter, 1½ feet +.	Southern Alleghany region Alleghany Mountains: local: but by cultivation widely distributed east of Rocky Mountains.	Heavy, very hard and strong; very *durable* in contact with the soil; shrinks considerably and suffers in seasoning. Employed largely for *fence posts*, in turnery, construction, treenails, wagon hubs, etc.	Poor, loose sands give best quality of timber; not succeeding well in compact soils, but will thrive on a thin one, and grows quickest on a rich, sandy loam. Very *rapid* grower while young; needs light very much; sprouts *persistently* and *vigorously* from the roots. To be only sparingly dispersed among shady companions, which will afford protection against the attacks of borers. Easily propagated from seed, also by cuttings, suckers, and stakes. For short rotations and coppice management.

List of one hundred species of trees of the United States most valuable for timber—Continued.

Name of species and limit of size.	Regions of abundant growth.	Characteristics and uses of wood.	Soil and climate, and characteristics of growth.
67. HONEY LOCUST	Central States	Heavy, hard, strong; very *durable* in contact with the soil.	Low, rich bottom land: rarely on high, dry, sterile hills; but often common on rich uplands, where it grows rapidly.
(SWEET LOCUST. HONEY SHUCKS. THREE-THORNED ACACIA. BLACK LOCUST.)	Best development in bottom land of lower Ohio River basin. Widely cultivated for hedges and ornament.	For *fence-posts*, rails, hubs, construction, etc.	Very *rapid grower; needs light.*
(*Gleditsia triacanthos* Linn.)			*Easily* grown from seed, but not from cuttings. Less liable to insect ravages; otherwise to be treated like Black Locust, which it is recommended to replace in Southern localities.
Height, 90 feet +; diameter, 2 feet +.			
68. *HACKBERRY*	Northern and mainly east of the Rocky Mountains.	Heavy, hard, strong; difficult to split; shrinks moderately, works well.	Will grow tolerably well on the most barren and poorest soils, but best in a fertile one, cool and moist, where it is of rapid growth.
(NETTLE-TREE).	Best development in basin of Ohio River.	Employed chiefly for fencing, but occasionally in the manufacture of cheap furniture.	In Western planting recommended only as an adjunct.
(*Celtis occidentalis* Linn.)			
Height, 80 feet +; diameter, 3 feet +.			
69. *RED MULBERRY*	East of longitude 98°	Rather heavy, hard, strong, and very durable.	Deep, rich loam, but grows well on poorer dry soil; endures shade.
(*Morus rubra* Linn.)	Best development in basins of lower Ohio and Mississippi rivers.	Employed for fence posts, in cooperage, snaths, and other tool stock, boat-building, etc.	For Southwestern planting.
Height, 60 feet +; diameter, 2 feet +.			
70. *MAGNOLIA*	Southern and Gulf States	Heavy: of medium weight, hardness, and strength; very white.	Cool, moist hummocks, with rich, deep, loose soil.
(SOUTHERN EVERGREEN. BIG LAUREL. BULL BAY.)	Best development along Mississippi in Gulf region.	Suitable for cabinetwork and interior finish.	Not hardy in Northern States; for strictly Southern climate.
(*Magnolia fœtida* (Linn) Sarg.)			
Height, 70 feet +; diameter, 2 feet.			

71. CUCUMBER TREE (*Magnolia acuminata* Linn.) Height, 90 feet +; diameter, 3 feet +.	Mainly Middle Atlantic region. Best development in the southern Alleghany Mountain region.	Light, soft, moderately durable. Closely resembling the Tulip tree, and used for the same purposes.	In cool, moist, deep, rich soils of mountain slopes, valleys, and "coves." Succeeds also in fresh sandy or gravelly soils of moderate richness.
72. **TULIP-TREE** (WHITE WOOD. YELLOW POPLAR.) (*Liriodendron tulipifera* Linn.) Height, 120 feet +; diameter, 4 feet +.	Eastern States Greatest development in valley of lower Wabash River, and on Western slope of Alleghany Mountains in Tennessee, North Carolina, and the Virginias.	Light, soft, stiff, not strong, nor very durable; shrinks, but seasons without much injury. Manufactured into *lumber* for interior finish, boxes, shelving, clapboards, panels of carriages, shingles, cheap furniture; pumps, wooden ware, boat building.	Deep, light, loamy, sandy, or clayey soils, in cool, moist situations. Tolerably rapid and persistent grower. Needs light very much; hardy. Poor seeder, and low percentage of germination; seed to "lie over." Sprouts fairly from stump. One of the largest and most valuable of the deciduous soft woods.
73. HARDY CATALPA (*Catalpa speciosa* Warder.) Height, 80 feet +; diameter, 3 feet +.	South Central States; rare, but widely cultivated for ornament. Best development in valley of lower Wabash River.	Light, soft, not strong; *very durable* in contact with the soil. Employed chiefly for *ties*, *posts*, rails; suitable for interior finish and used somewhat for cabinet wood.	Adapted to a great variety of soils; best on low, ric bottom lands. Very rapid grower; sprouts vigorously from the stump; *shade enduring*. Good seeder and keeper. Readily propagated from seed, cuttings, and layers. Desirable tree for Western planting. Foliage subject to ravages of insects.
74. COMMON CATALPA (*Catalpa catalpa* (Linn.) Karst.) Height, 40 feet +; diameter, 1½ feet +	Gulf States, but widely cultivated for ornament.	Like the Hardy Catalpa, and used for the same purposes in the South.	Like the preceding, to be used in Southwestern planting, to which it is best adapted.

THE ASHES, MAPLES, ELMS, ETC.—The wood of the ashes is heavy, hard, strong, stiff, quite tough, not durable in contact with soil, straight grained, rough on the split surface, and coarse in texture. The wood shrinks moderately, seasons with little injury, "stands" well, and takes a good polish. In carpentry ash is used for finishing lumber, stairways, panels, etc.; it is used in shipbuilding, in the construction of cars, wagons, carriages, etc., in the manufacture of farm implements, machinery, and especially of furniture of all kinds, and also for harness work; for barrels, baskets, oars, tool handles, hoops, clothespins, and toys. The trees of the several species of ash are rapid growers, of small to medium height with stout trunks; they form no forests, but occur scattered in almost all our broad-leafed forests.

List of one hundred species of trees of the United States most valuable for timber—Continued.

Name of species and limit of size.	Regions of abundant growth.	Characteristics and uses of wood.	Soil and climate, and characteristics of growth.
75. **WHITE ASH** (*Fraxinus americana* Linn.) Height, 100 feet +; diameter, 3 feet +.	Eastern; wide range Best development in lower Ohio basin.	Heavy, hard, *strong, very elastic;* old timber brittle. Very valuable. Employed chiefly in the *manufacture* of agricultural implements, carriages, handles, oars, interior finish, cabinetwork, furniture, and flooring.	Depth, looseness, and moisture of soil of most importance. Best in moist atmosphere of northern and eastern exposures. Will succeed in wet and compact soil if well drained, but maintains itself with slow growth in a light and dry one. Rapid grower; light needing, thinning out rapidly, and therefore requiring shady, slower-growing companions. Sprouts vigorously and persistently from the stump. Often a poor seeder; seed not easily kept, tending to "lie over." Liable to attacks of borer and to frost when young.
76. **BLACK ASH** (HOOP ASH. GROUND ASH.) (*Fraxinus nigra* Marsh.) Height, 90 feet +; diameter, 2½ feet +.	Northern and Northeastern States. The most northerly of the ashes.	Rather heavy, rather soft, tough, *elastic*, not very durable when exposed. Lately much used for interior finish and cabinetwork, fencing, barrel hoops, baskets, and fuel.	Soils like those for *F. americana*, but *indifferent* to *drainage*, and more dependent on moisture; therefore well adapted to undrained situations in cool climate; otherwise like *americana*.
77. GREEN ASH (*Fraxinus lanceolata* Borkh.) Height, 50 feet +; diameter, 1½ feet +.	Western States east of Rocky Mountains and South; most common and best developed in the Mississippi Valley.	Heavy, hard, strong Often employed for same purpose as that of White Ash, but somewhat inferior to it in quality.	Less dependent on humidity of soil than the White Ash, but prefers a deep, cool, moist soil, and will succeed even on inundated lands. Rapid but not persistent grower. Seed germinates readily. The ash for Western planting.

78. BLUE ASH	Central States	Heavy, hard; as valuable as any of the ashes, and *most durable* of all when exposed to alternate dryness and moisture.	Less dependent on moisture than other ashes; prefers a rich, deep, moist soil, and grows well on dry limestone soils.
(*Fraxinus quadrangulata* Michx.)	Best development in basin of lower Wabash River.	Used for much the same purposes as that of White Ash, but principally in *carriage making* and flooring. Very superior for hayfork and other tool handles.	Recommended for Western planting.
Height, 70 feet +; diameter, 2 feet +.			
79. OREGON ASH	Northwestern coast region	Rather heavy, sometimes brittle, not strong; similar to that of White Ash.	Moist soils and climate.
(*Fraxinus oregona* Nutt.)	Best development in bottom lands of southwestern Oregon.	Employed chiefly in the manufacture of furniture, carriage and wagon frames, cooperage, fuel.	
Height, 60 feet +; diameter, 1½ feet +.			
80. **SUGAR MAPLE**	Eastern United States and northward.	Heavy, *hard, strong*, tough; not durable, and subject to attack of boring insects.	Best on moderately deep, loose, well drained, strong, loamy, and calcareous soil, in moist, cool position; will grow also on stiff clay, if not too wet, and on stony hillsides, if not too dry.
(Hard Maple. Sugar-tree.)	Best development in region of the Great Lakes.	Employed chiefly in the *manufacture* of furniture, shoe lasts and pegs, saddletrees, turnery, interior finish, flooring; in shipbuilding, for keels, keelsons, shoes; *excellent fuel*. The "bird's-eye" and "curled" maple of this species are much prized in cabinetmaking.	Tolerably rapid and persistent grower; moderately shade enduring; does not sprout well from the stump.
(*Acer saccharum* Marsh.)			Not well adapted to dry regions.
Height, 100 feet +; diameter, 3 feet +.		Furnishes the maple sugar of commerce.	
81. SILVER MAPLE	Eastern United States	Rather heavy, soft, brittle, not very strong, nor durable when exposed to the weather or soil.	Adapted to a variety of soils and climates, but best on rich, moist soil.
(White Maple. Soft Maple.)	Best development in basin of lower Ohio River.	Used in the manufacture of furniture, flooring, for fuel.	*Very rapid* but not persistent grower; light needing; sprouts vigorously from the stump; liable to injury from winds; comparatively free from insects.
(*Acer saccharinum* Linn.)		Yields a good quality of maple sugar.	Especially recommended as a nurse in Western planting.
Height, 90 feet +; diameter, 3 feet +.			
82. RED MAPLE	Eastern United States and northward; wide range.	Slightly heavier and harder than that of Silver Maple; not strong nor durable; inferior to that of Sugar Maple, but superior to Silver Maple.	Best on low, wet soils, but will thrive in moderately dry situations.
(Soft Maple. Water Maple. Swamp Maple.)	Greatest development in valleys of lower Wabash and Yazoo rivers.	Used chiefly for cabinetmaking, in turnery, for wooden ware, gunstocks, light fuel.	Rapid, but moderately persistent grower; endures more *shade* than *A. saccharinum* L.; sprouts vigorously from the stump.
(*Acer rubrum* Linn.)			Usefulness in dry climates questionable.
Height, 90 feet +; diameter, 3 feet +.			

List of one hundred species of trees of the United States most valuable for timber—Continued.

Name of species and limit of size.	Regions of abundant growth.	Characteristics and uses of wood.	Soil and climate, and characteristics of growth.
83. OREGON MAPLE	Pacific slope	Rather light, hard, strong; said to be one of the best and most valuable woods of Pacific coast.	Rich bottom lands.
(CALIFORNIA MAPLE. BROAD-LEAFED MAPLE.)	Best development on rich bottom lands of southern Oregon.	In Oregon, employed largely in the manufacture of furniture, ax and broom handles, snowshoe frames, etc. The "curled" wood of this species is highly prized in cabinetmaking.	Rapid grower in moist climate.
(*Acer macrophyllum* Pursh.)			Important on the Pacific slope.
Height, 90 feet +; diameter, 4 feet +.			
84. *BOX ELDER*	East of Rocky Mountains, rather Southern and Western.	Light, soft, not strong; inferior	Best on low, rich ground, but will succeed on upland.
(ASH-LEAVED MAPLE.)	Best development in valleys of Wabash and Cumberland rivers.	Manufactured chiefly into paper pulp, wooden ware, and used somewhat in cooperage and for interior finish, fuel, etc.	Rapid but not persistent grower; sprouts well from the stump; hardy. *Easily propagated.*
(*Acer negundo* Linn.)			For forestry purposes, imported only as *nurse* and soil cover, especially in Western planting.
Height, 50 feet +; diameter, 2 feet +.			
85. **WHITE ELM**	East of the Rocky Mountains	Heavy, hard, strong, very *tough*, but not durable; inferior; often difficult to split.	Adapted to a great variety of soils, but best on a rich, loose, moist one; requires less moisture than the ashes; bears occasional flooding.
(AMERICAN ELM. WATER ELM.)	Probably attains its best developments near its northern limits.	Employed principally for wheel and chair stock, coarse lumber, flooring, furniture, cooperage, and fuel.	Rapid and persistent grower; sprouts well; endures moderate shade.
(*Ulmus americana* Linn.)			Important in forestry mainly as a *nurse* and for soil-cover.
Height, 100 feet +; diameter, 3½ +.			Recommended for Western planting.
86. **CORK ELM**	Northeastern United States	Heavy, hard, very strong, tough, and *elastic;* superior to that of other elms.	Rich, moist, heavy, loamy soils.
(HICKORY ELM. WHITE ELM. CLIFF ELM.)	Best development in southern Ontario and Michigan.	Extensively used in the *manufacture* of agricultural implements, wheel stock, for ties, bridge-building and ship timber, rails, bicycle rims, and all places where a very tough noncleavable wood is needed.	Probably to take the place of the White Elm in forestry.
(*Ulmus racemosa* Thomas.)			
Height, 90 feet +; diameter, 2 feet +.			
87. *WING ELM*	Southeastern United States	Heavy, hard, tough. Used for wheel stock, tool handles, coarse lumber, and fuel.	Most commonly on dry, gravelly uplands, but frequently in moist bottoms and along water courses. Very adaptive and to be used in Southwestern planting in place of the White Elm.
(*Ulmus alata* Michx.)	Best development west of the Mississippi River.		
Height, 80 feet +; diameter, 2 feet +.			

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88. *SLIPPERY ELM* (RED ELM. MOOSE ELM.) (*Ulmus pubescens* Thomas.) Height, 60 feet +; diameter, 2 feet +.	Northern Atlantic and Gulf States. Best development in Western States.	Heavy, hard, strong; more durable than other elms. Used principally for wheel stock, sills, posts, ties, rails, fuel. Large quantities of the inner bark used for medicinal purposes.	Rich, moist, well-drained soil; much like that of the White Elm, but will bear drier and more elevated situations. Rapid, but not persistent grower. Easily propagated,
89. YELLOW BIRCH (GRAY BIRCH.) (*Betula lutea* Michx. f.) Height, 80 feet +; diameter, 3 feet +.	Northeastern United States and northward. Best development north of the Great Lakes.	Heavy, hard, and strong Chiefly for furniture, wheel hubs, pill and match boxes, button and tassel molds, and extensively for *fuel.* Valuable for *cabinet* wood and building purposes.	Cool, moist atmosphere preferable. Capable of thriving on poor, but best on a moderately deep, loose, moist sand; hardy and very adaptive as to soils. Rapid and tolerably persistent grower; sprouting qualities greatly dependent on site. Vigorously in moist soils. Light needing. Easily propagated.
90. SWEET BIRCH (CHERRY BIRCH. MAHOGANY BIRCH.) (*Betula lenta* Linn.) Height, 60 feet +; diameter, 3 feet +.	Same range as Yellow Birch	Heavy, very strong, hard like that of Yellow Birch, but rose-colored, and perhaps more valuable for cabinet-work. Much used in the manufacture of *furniture* and for fuel.	Same as above species but apparently not as rapid nor as persistent a grower.
91. RIVER BIRCH (*Betula nigra* Linn.) Height, 80 feet +; diameter, 3 feet.	Eastern States Best developed in the South Atlantic and Lower Mississippi Valley regions.	Rather light, hard, strong, close grained, considerably used for furniture, interior finishing, turnery, bowls, other wooden ware, and fuel.	Almost exclusively on moist or inundated bottoms, along streams, and near ponds. Succeeds very well on moist, rich, porous, upland soils Important as a substitute for Northern birches in Southwestern planting.
92. *CANOE BIRCH* (WHITE BIRCH. PAPER BIRCH.) (*Betula papyrifera* Marshall.) Height, 60 feet +; diameter, 2 feet +.	Northwestern, Northern, and Northeastern in United States. Reaches a higher latitude than any other American deciduous tree.	Rather heavy, hard, tough, strong; not durable. Extensively employed in the manufacture of spools, shoe lasts and pegs, *turnery* of other kinds; lately much used in making *pulp;* excellent *fuel.*	Mostly on sandy soils in northern climates. Not on clay lands where the Yellow Birch thrives.
93. *WHITE BIRCH* (OLD-FIELD BIRCH. GRAY BIRCH.) (*Betula populifolia* Marsh.) Height, 30 feet +; diameter, 1 foot +.	Northeastern coast region	Rather heavy, soft, not strong nor durable. Employed largely for spools, shoe-pegs, *wood pulp,* hoop poles, and fuel.	Adapted to drier and poorer soils than other birches. Short-lived; rapid grower; *sprouts readily* from the stump. Probably least important of the birches.

List of one hundred species of trees of the United States most valuable for timber—Continued.

Name of species and limit of size.	Regions of abundant growth.	Characteristics and uses of wood.	Soil and climate, and characteristics of growth.
94. **BASSWOOD** (AMERICAN LINDEN. BEE-TREE. LIME-TREE.) (*Tilia americana* Linn.) Height, 100 feet +; diameter, 3 feet +.	East of the Mississippi and Missouri rivers; wide range. Greatest development in valley of Lower Wabash River.	Light, soft, not strong; easily worked. Employed largely in the manufacture of wooden ware, cheap furniture, *paper pulp*, for *panels*, bodies of carriages, clapboards, lumber, in turnery, and for bakers' light fuel.	Deep, moderately loose, and somewhat moist soil; can endure a wet soil, but will not thrive on a dry one. Rapid and persistent grower; sprouts vigorously from the stump; endures moderate shade. Not very hardy, but in cool situations a desirable adjunct in forestry.
95. WHITE BASSWOOD (*Tilia heterophylla* Vent.) Height, 60 feet +; diameter, 3 feet +.	Middle and South Atlantic region. Best development in southern Alleghanies.	Like the preceding; not being distinguished in the market, and used for the same purpose.	Deep, rich, moist, well-drained soils of mountain coves, lower slopes, and on the banks of streams; frequent also on rich limestone soils of the plain, and succeeds on dry, gravelly, clayey, and sandy soils of moderate richness; important for Southern planting in place of the Northern basswood.
96. SYCAMORE (BUTTONWOOD. BUTTON-BALL-TREE. WATER BEECH.) (*Platanus occidentalis* Linn.) Height, 120 feet +; diameter, 6 feet +.	East of the Mississippi and Missouri rivers. Best development in bottom lands of the Ohio and Mississippi rivers.	Rather heavy, rather hard, not very strong. Extensively used in the manufacture of cigar and tobacco boxes, furniture, interior, for butchers' blocks, ox yokes, and coarse planks; lately much used for making butter and lard trays and wooden bowls. Little used for fuel, owing to difficulty in splitting.	Rich, moist, soil, low ground, thriving in swamps subject to overflow; grows well on moist upland. Wide climatic range, but liable to frost when young; light needing; secondary in forestry.
97. COTTONWOOD (CAROLINA POPLAR. BIG COTTONWOOD. NECKLACE POPLAR). (*Populus deltoides* Marsh.) Height, 100 feet +; diameter, 4 feet +.	East of the Rocky Mountains	Very light, soft, not strong nor durable. The wood shrinks moderately (some crossgrained forms warp excessively), but checks little; is easily worked. Used as building and furniture lumber, in cooperage for sugar and flour barrels, for crates and boxes (especially cracker boxes), for wooden ware, and paper-pulp.	Adapted to a variety of soils, but best in a moist, strong, loamy one. Exceedingly *rapid* grower; sprouts vigorously from the stump; light needing; *thinning out rapidly;* short lived and exhaustive to the soil; most readily propagated. Has been recommended for planting on Western prairies, chiefly on account of its rapidity of growth, ease of procuring plant material, and of propagation. In forestry should be used only as a nurse with better and shady kinds.

98. *LARGE-TOOTH ASPEN* (WHITE POPLAR.) (*Populus grandidentata* Michx.) Height, 60 feet+; diameter, 2 feet+.	Northern and Northeastern States.	Light, soft, not strong nor durable. Employed chiefly in the manufacture of wood pulp, and used somewhat in turnery and for wooden ware.	Northern States, in moist situations; grows well in all fresh upland soils.
99. *BALM OF GILEAD* (BALSAM POPLAR. TACAMAHAC.) (*Populus balsamifera* Linn.) Height, 70 feet+; diameter, 3 feet+.	Northern United States.	Very light, soft, not strong. Quality of timber quite equal to that of any poplars, but little used where it is abundant, except for pulp. Suitable for wooden ware and uses like cottonwood.	A substitute for cottonwood in the most northern localities. Thrives in moist, rich, well-drained soils.
100. *ASPEN* (AMERICAN ASPEN.) (*Populus tremuloides* Michx.) Height, 50 feet+; diameter, 1½ feet+.	Northern and Southwestern (in United States); in Pacific region, from 6,000 to 10,000 feet elevation.	Light, soft, not strong nor durable. Employed largely in the manufacture of paper-pulp; in Pacific region used occasionally for flooring, in turnery, and for fencing and light fuel.	Of value mainly as a tree naturally covering denuded mountain sides and as a quick-growing nurse for better kinds.

NOTE 1.—Trees which may be looked to as capable of enduring more or less unfavorable sites:
Barren soils: Nos. 3, 4, 24, 30, 47, 48, 53, 55, 58, 62, 64.
Insufficiently drained soils: Nos. 3, 16, 20, 27, 28, 31, 32, 48, 54, 55, 69, 83, 85, 86, 89.
Stiff soils: Nos. 31, 32, 53, 54, 67, 73, 74, 77, 84, 85.
Sea-coast planting: 3, 24 (?), 30, 32, 84.
Prairie planting: Tried, 1, 4, 17, 25, 30, 31, 47, 51, 57, 59, 60, 62, 63, 64, 66, 67, 68, 70, 73, 75, 77, 78, 79, 81, 82, 84, 85, 87, 89. Worthy of trial, 2, 7, 10, 11, 24, 31, 39, 40, 48, 71.

NOTE 2.—Of exotics which have been successfully introduced for forest culture, the following may be cited as deserving more or less attention:

Conifers: Scotch Pine (*Pinus sylvestris*, L.), Austrian Pine (*Pinus austriaca*, Hoss.), Corsican Pine (*Pinus laricio*, Poir.), Norway Spruce (*Picea excelsa*, D. C.), Nordmann's Fir (*Abies Nordmanniana*, Link.), European Larch (*Larix Europæa*, D. C.).

Broad-leafed trees: English Oak (*Quercus robur*, L.), Cork Oak (*Quercus Suber*, Linn.), Black Alder (*Alnus glutinosa*, Gaertn.), Ailanthus (*Ailanthus glandulosus*, Desf.), Black Mulberry (*Morus nigra*, L.), Australian Gum Trees: *Eucalyptus globulus*, Labil., *E. rostrata*, Cav. Australian Wattle Trees: *Acacia decurrens*, Willd., *A. pycnantha*, Benth. Gray Poplar (*Populus canescens*, Smith.).

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